

concrete construction

ARTICLES

1 INDEX TO VOLUMES 1, 2, 3 and 4

Except for a few minor items dealing with current news, we have listed here all of the articles published in Concrete Construction since the first issue appeared in September 1956. The index headings are identical with those which appeared with the articles themselves, so that these listings will constitute a complete index to date for readers who have been making use of our perforated pages and file categories.

5 WATERSTOPS IN REVIEW

There's a waterstop available today for virtually every conceivable problem of leakage through joints in concrete construction. Here's a fast survey of some of the more common types and how they work.

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This article strives, mainly through pictures, to provide a basis for the recognition of various types of cracks in concrete pavements.

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where
split
seconds
don't
count

If you're flying through space, like the aerialist in our picture, you're bound to be interested in split second timing. But if you're either producing or buying ready mixed concrete, you should be much more interested in the quality of the product than in the speed with which it's produced.

Unless you have some understanding of what actually takes place in the drum of a ready mix truck, you could very easily attach too much importance to both the speed of loading and the speed of mixing. In mixing about 40 cubic feet of materials (coarse aggregate, sand, cement and water) to produce a cubic yard of concrete, it is obvious that the component materials will occupy after mixing only about 67½ per cent of their volume before mixing.

Under current standards a 5-cubic yard truck mixer has a total drum volume of 220 cubic feet. If the approximately 200 cubic feet of materials needed to produce 135 cubic feet of concrete (5 cubic yards) could be injected into the drum instantaneously, you'd be almost bound to have a spillage problem, and this is in fact what sometimes happens as trucks move from the batching plant to the job site. In addition, of course, there would be almost no room left in the drum for mixing the concrete.

The point is that it takes time to "shrink" the materials which go together to make concrete, and it just doesn't make any sense to emphasize speed at this most critical stage of producing a critical construction material. If you increase the speed of the mixing drum, you may actually reduce the speed of mixing due to centrifugal action.

So let the aerialist have fun with his split-second timing but be sure that you allow sufficient time for the important job of mixing that next load of concrete.

CONCRETE TRANSPORT MIXER CO.

Makers of the outstanding ROCKET and HI-LO concrete truck mixers 4975 Fyler Ave.—St. Louis 9, Mo.

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Published from September 1956 through December 1959

(NOTE: Tear sheets or thermofax copies of back articles will be furnished on request at a cost of 50c per article to cover handling and mailing. Minimum order \$1.00. Please enclose remittance with order.)

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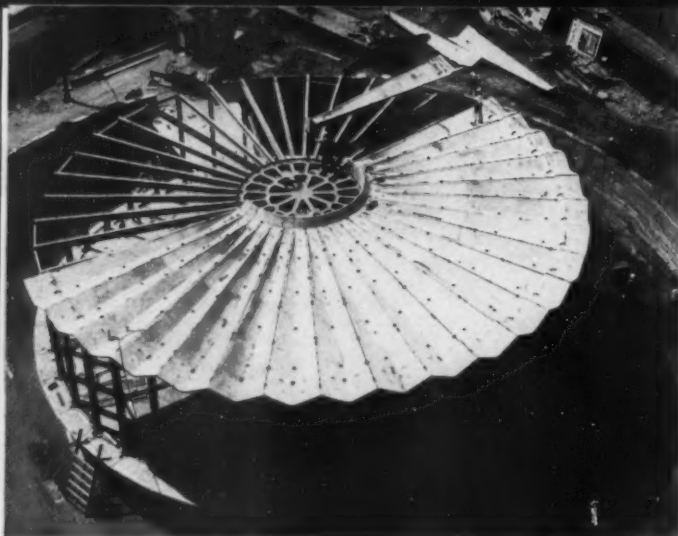
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they bank on concrete

As you might expect concrete played a major role in the construction of what has been described as the world's most distinctive and photogenic bank—the new Crown Zellerbach Office of the American Trust Company in San Francisco. The roof of the perfectly round structure consists of lightweight concrete shell elements which create the accordion-pleated effect which shows so clearly in this picture. The shells were bolted to steel beams, then welded together by means of steel channels cast into the concrete, and finally sheathed with copper. The building was designed by architects Skidmore, Owings and Merrill.

quick, Watson, the machete!

Almost lost in a dense jungle of reinforcing steel, workmen on the reactor shielding structure for the Yankee Atomic Electric Company, at Rowe, Massachusetts prepare for concrete placing operations. Scheduled for completion late in 1960, the \$50,000,000 project calls for the placement of approximately 5,000 cubic yards of ready mixed concrete. It is one of the first privately financed atomic electric generator plants to be constructed in the United States. The primary plant shield structure is located 25 to 125 feet above grade to provide convenient access for loading and unloading of nuclear components.



CONCRETE CONSTRUCTION MAGAZINE

P.O. Box 444 Elmhurst, Illinois

TErrace 4-5110

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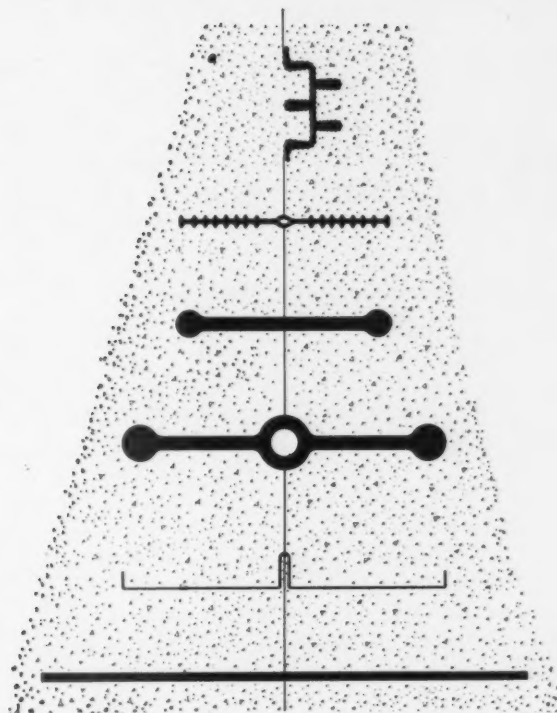
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Individual subscriptions at the rate of \$5.00 per year, \$9.00 for 2 years (U.S.A.); \$10.00 per year (Foreign). Single copies \$1.00. Subscription order must be accompanied by check.

WATERSTOPS

IN REVIEW



Drawing courtesy American Concrete Institute

A survey of the basic types now available

IN THE PUBLIC'S MIND, concrete is synonymous with rock-like density. In reality, however, walls of concrete which are to experience water pressure on one side must be specially constructed if they are to remain watertight. Even the most dense concrete will allow a certain amount of water under pressure to pass through. However, the real trouble lies in the leakage which can occur through the joints which are a necessity in practically all concrete walls. This problem is common in such construction as basement walls, swimming pools, power plants, water tanks and canal structures.

All concrete contains more water than is needed to combine chemically with the cement. This extra water is required for handling purposes. As it evaporates, the concrete shrinks and is literally pulled apart. If no joints are provided, a slab will crack irregularly to accommodate these shrinkage forces. If joints are constructed, the cracking will occur at these predetermined locations. It is then possible to install a

waterstop across the joint to insure watertight walls, floors and decks.

The first waterstops used were made of copper, which is ductile and resistant to rust and other deterioration caused by exposure to water, but is somewhat lacking in ability to resist fatigue caused by continued opening and closing of joints. Flexible waterstops combine the attributes of the metallic variety with a number of their own. In 1935, the Bureau of Reclamation began using rubber dumbbell waterstops in many of the structures they were building which were to withstand hydrostatic loads. After World War II, manufacturers began using polyvinyl chloride (pvc) plastics for waterstops.

types of waterstops

Considering the limitations imposed by patents, the competitive climate in this country, the urge to be different and plain difference of opinion on how best to do anything, it was only natural that a number of waterstops

varying in shapes and materials should make an appearance.

And appear they did. Quite a bewildering number are now on the market. Although each has claims for its individual superiority, almost all more or less conform to one of six shapes (see sketch): *labyrinth, flat corrugated, dumbbell 2-bulb, dumbbell 3-bulb, flexible metal and rigid metal plate.*

Labyrinth waterstops were evolved to avoid carpentry in splitting forms to allow half of the unit to extend into the next pour. Flat corrugated types have numerous ribs or ridges along their length to provide anchorage in the concrete. Dumbbell varieties rely upon the bulbs at the ends to anchor the unit securely. The 3-bulb type depends upon the center bulb to accommodate movement at the joint, whereas the 2-bulb variety relies upon the flexibility of the rubber or plastic. Flexible metal waterstops are V-shaped at the joint to allow movement. Rigid metal plates are embedded uncoated

in the concrete on one side of the joint and coated with asphalt on the other side to permit sliding of the plate during expansion and contraction of the concrete.

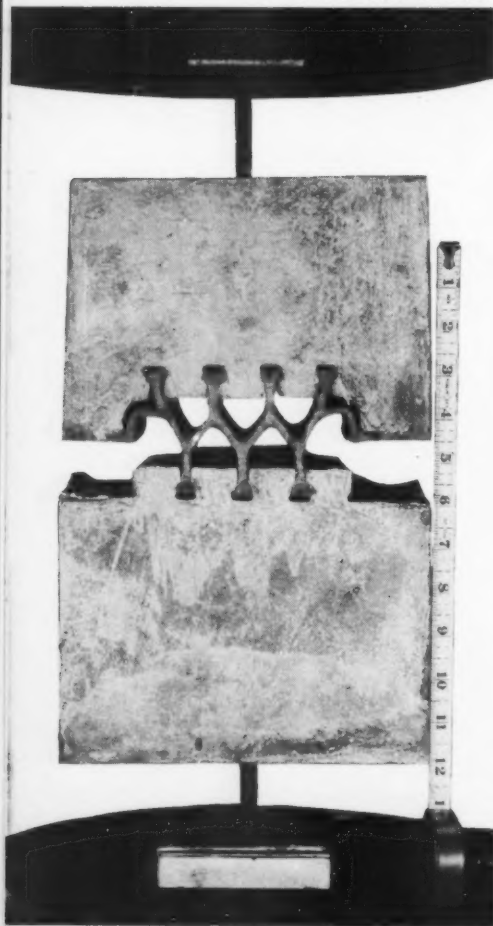
Materials used for waterstops are almost entirely one of these three types: metal (copper or stainless steel), rubber or plasticized polyvinyl chloride plastics. A comparison of these materials will be made in the following sections.

watertightness

First and foremost, a waterstop must prevent the passage of water through the joint across which it is installed. When used under the conditions for which they were intended, tests have

The flexible polyvinyl labyrinth waterstop, shown here under test, stood up well under the considerable punishment which resulted when the joint was opened a full 1½ inches.

Photo courtesy Water Seals, Inc.



shown that all but one of the six types either prevent the passage of water altogether or restrict it to negligible amounts.

The conditions for which the various types are suited vary considerably, however. Most tests indicate that the least effective of the six types is the rigid metal plate variety. The amount of water it permits to pass is 100 times that of the labyrinth shape, which appears to be most effective when joint movement is minimal. The labyrinth waterstop offers important savings in installation cost because no form carpentry is required.

Dumbbell types are also most effective. The 3-bulb types are somewhat more watertight than the 2-bulb.

Flat corrugated and flexible metal types, even at joint openings of ½ inch and water pressures of 50 psi, show remarkable freedom from leakage. Just as important, when these joints reclose, their watertightness seems to be retained. In terms of watertightness and economy on projects involving appreciable joint movement, the flat corrugated shapes seem to offer some advantages.

An important factor in the watertightness of any waterstop is the integrity of splices. Great care should be taken to follow the manufacturer's instructions regarding splicing to insure best possible performance.

durability

Regardless of the efficiency of a waterstop, it will be of little value if it is made of a material which will deteriorate under the stresses of repeated stretching and relaxing and continued exposure to water and weathering. Most structures which need waterstops—homes, water tanks, canals, etc.—are built to see service for several decades. Because it is not practical to replace waterstops, they are expected to last the life of the structure.

Since flexible waterstops have been in use for a comparatively short time, there are no long-term test results to gage their durability. It is possible, though, to make some deductions from short-term tests and performance of the materials under similar conditions. (The effective life of any waterstop will, of course, be greatly affected by the quality of the protective coating and the manner in which it is applied).

Metal waterstops vary considerably

in durability. Iron and carbon steel are not used any more because of the problem of corrosion. Copper and stainless steel can reasonably be expected to resist corrosion for the usable life of practically any structure. Mechanical fatigue (failure due to repeated stretching and contraction) is usually the governing factor in the service life of metal waterstops.

Rubber is an excellent material for waterstops as long as it retains its flexibility. When it becomes hard, it cracks and loses its effectiveness as a water barrier. Rubber keeps its flexibility longest when not exposed to oxygen and sunlight. Waterstops are not ordinarily subjected to sunlight since they are buried in concrete; but they do come into contact with oxygen. This is present in the water on one side and the air on the other side of the unit. Unfortunately, this exposure takes place at the most critical part of the waterstop—the section at the joint opening which must experience the greatest amount of flexing. Degradation is most rapid when the rubber is being stretched. Good joint sealers will of course reduce the effect of air. Rubber does resist the adverse effects of alkaline attack quite well. Although no long-time tests are available, experience with rubber under like conditions indicates that an effective life of 35 years can be expected with the best grades.

Polyvinyl chloride (pvc) compounds in their newest forms make ideal waterstop materials. Pure pvc is a hard, rigid material that would be quite unsuitable for this work. However, when a plasticizing agent is added, it becomes tough and flexible. In its altered form it has been used for underground sheathing and insulation in Canada for nearly 20 years without a single failure. Tests have shown that it is virtually inert, being unaffected by chemical attacks, including an alkaline environment—a quality essential for a material which is to be embedded in concrete.

Early pvc waterstops developed some troubles because the plasticizing agent gradually dissolved in the water leaving the material in its hard, stiff, pure form. Joint movement then cracked it and leakage became serious. In recent years polymeric plasticizers have been developed which do not dilute in water. These new pvc materials appear to be extremely effective for waterstop use.

other physical properties

There are a number of physical properties, other than durability, which help to determine the desirability of metal, rubber and pvc as waterstop materials. These include resistance to the effects of wide temperature variations, toughness, stiffness and creep.

High temperatures found in the field do not ordinarily affect the mechanical properties of waterstop materials. Low temperatures, however, do materially affect their performance. Metals are least affected by drops in temperatures. Some pvc compounds and rubbers are unworkable during cold weather. High quality rubber and properly plasticized pvc should function adequately at temperatures as low as minus 20 degrees F. If water is to be kept on one side of the waterstop, as in a tank, no trouble should be experienced since it will act as a moderating influence. Most waterstop manufacturers will be able to supply test results to indicate their product's qualities in this respect.

Toughness is of importance in the material in order to resist damage to the waterstop while it is being installed and during concreting. Perhaps the most crucial time occurs when one-half of the unit is protruding from the concrete. At this time the waterstop is exposed to impact damage by equipment and construction materials, as well as extreme air temperatures. Both rubber and pvc appear to have satisfactory toughness ratings. They are difficult to tear and have sufficient resilience to reassume their original shape if they are accidentally bent. It is in the latter characteristic that metal proves deficient. If a metal waterstop is bent, it is sometimes awkward and difficult to restore its original shape.

Stiffness is necessary to prevent folding during concreting. Metal waterstops rate very high in this attribute, of course. Flexible waterstops of 1/2 inch thickness or more have been proved to resist folding sufficiently during normal concreting. Bracing the waterstop against a nearby reinforcing bar will help prevent folding of flexible waterstops.

Creep is an undesirable property of pvc. When stretched, pvc tends to creep or lengthen somewhat. As the joint opens, elongation of the pvc material bridging the opening might occur. If, upon reclosing, the material were to be pinched, this could result in failure of the waterstop. Higher

temperatures accelerate creep. Recent tests, however, have shown that the amount of pvc creep is so small that under actual field conditions no trouble will be experienced.

your choice

No blanket recommendation can be given on waterstops since no one unit is intended to embrace all installations. Size of the waterstop, shape and material, conditions under which it must perform and the quality of installation all will have an important bearing on the performance that may be expected. Another important factor is joint location and construction. If insufficient or poorly placed joints are made in a structure, random cracks will form in places other than the joint. Also, if the joint is poorly made, e. g., if reinforcement is lapped or not reduced at the joint, it will not perform properly.

Almost all waterstops on the market, if correctly installed in a properly jointed structure under conditions for which they were intended, will operate correctly and give trouble-free service for decades. All you need do is analyze your problem and make a choice of the many waterstops available. END

The flat corrugated type waterstop at the right, with its multi-ribbed cross-section, provides a permanent and tenacious grip to the concrete in which it is embedded. The hollow center bulb offers the flexibility and elasticity necessary to handle extension and transverse movements.

With a simple clamping device and a small splicing kit, the rubber waterstop pictured below can be spliced on the job in just 6 minutes.

Readers who would like to have additional information on the subject discussed in the foregoing article may request it by mailing in one of the reader service forms in the back of this issue.



Photo courtesy Serviced Products Corporation

The photo above illustrates field installation of a dumbbell 3-bulb waterstop during construction of a concrete tank. In the foreground a section of the 2-bulb type has been spliced into the waterstop.

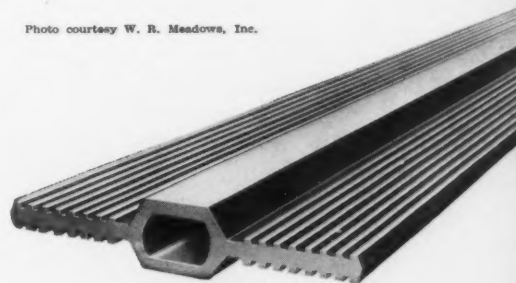


Photo courtesy W. R. Meadows, Inc.



Photo courtesy Gates Rubber Co.

Here is some long-needed help in recognizing the more common types of pavement cracks, along with some indications of probable causes.

An Analysis of Pavement Defects

WITH THE GREAT STRIDES which have been made in concrete technology and structural design, the problem of pavement cracking is no longer the serious consideration it once was. But nevertheless concrete pavements still develop cracks under certain conditions, and awareness of this fact, coupled with an understanding of the various factors involved, is an essential part of any good concrete man's bag of tricks.

While the subject is admittedly quite complex, and simplification is therefore correspondingly difficult as well as dangerous, it is the purpose of this brief article to show pictorially some of the more common pavement defects and to suggest some plausible explanation for each. Some effort has been made in the selection of photographs to show situations which lend themselves readily to explanation, but it is by no means presumed that the brief analyses presented here are either complete or conclusive.

It is hoped that this presentation may become the nucleus, through the medium of reader participation, of a cumulative pictorial record which will facilitate the instruction of new people in our industry, as well as help to organize the findings and observations of the experienced. With this thought in mind, readers are urged to comment upon and criticize this first attempt, and also to send along similar pictures and information for inclusion in a follow-up article.

For the sake of simplicity the various defects pictured have been arranged in two broad categories: those associated with wheel loads and those not associated with wheel loads. Also, for purposes of this discussion a slab is considered to be the area of pavement

between transverse joints in a single traffic lane.

DEFECTS INVOLVING WHEEL LOADS

corner breaks

Figure 1 shows a fairly typical corner break in which the crack runs from the transverse joint of the pavement to the center joint. Where this occurrence is associated with wheel loads the legs on both sides will generally be from 2 to 4 feet long. When the legs on one or both sides are less than 2 feet long, it is likely that the defect is the result of temperature stresses or unequal expansion restraint, such as might result from infiltration or the presence of a plug of concrete in the joint space.

slab end breaks

A typical slab end break, such as that shown in Figure 2, frequently consists of a transverse crack 5 to 8 feet from a joint and ahead of the joint in the direction of traffic. Breaks of this type are usually accompanied by faulting, and they are most often caused by loads applied after there has been a loss of subgrade support as a result of consolidation or pumping action.

slab edge breaks

This type of defect is generally confined to an area within 2 feet of the edge of the slab. It may consist of either a long longitudinal crack or a series of cracks in the form of arcs leaving and returning to the edge of the pavement, as shown in Figure 3.

faulting of slab ends

Faulting, or vertical displacement, at joints and cracks is caused by repetition of wheel loads. It is directly

related to the effectiveness of load transference at joints, as well as to the adequacy of subgrade support. This condition will often be noted in combination with slab end breaks (Figure 2), and is frequently accompanied by pumping.

pumping

While wheel loads, load repetitions and the accompanying deflections are the immediate causes of pumping (Figure 4), this phenomenon is more immediately related to such factors as surface drainage, the effectiveness with which loads are transferred, and the character of subbase and subgrade soil. Pumping can occur at joints, cracks and edges, and the name is quite descriptive of what actually takes place. The slab, as it deflects under load and then recovers, actually functions as a crude but effective pump to bring a mixture of subsoil and water to the surface.

DEFECTS NOT INVOLVING WHEEL LOADS

plastic shrinkage cracks

Short diagonal cracks in the interior of slabs, such as those shown in Figure 5, are generally plastic shrinkage cracks. They tend to converge toward the center of the slab in the direction of paving. While the surface openings are quite conspicuous, cracks of this type seldom extend very far beneath the surface. Plastic shrinkage cracks form during the early hardening of concrete when wind velocity, low humidity, high air temperature (or all three factors acting together) cause water to evaporate from the concrete surface more rapidly than it is replaced by bleeding.

spalls

The unsightly defects shown in **Figures 6 and 7** are what are known as spalls. They are generally quite shallow and almost never do they extend through the depth of the slab. Faulty construction practices are generally responsible for spalling, although poor maintenance, especially failure to keep foreign material from accumulating in joints and cracks, may also be a factor. Edge spalls, especially at the intersections of transverse joints or cracks with longitudinal center joints, are sometimes incorrectly classified as corner breaks. The primary cause in this case is not load but interior restraint stresses.

transverse cracks

Transverse cracks which occur near the center of slabs 40 feet in length are usually simple contraction cracks. **Figure 8** shows a typical example. When transverse cracks occur within 2 or 3 feet of a joint (**Figure 9**), and there is no accompanying faulting of the joint, the cause is usually frozen dowels.

longitudinal cracks

Full length longitudinal cracks located within 3 feet of the center joint (**Figure 10**) may be caused by an ineffective center joint. Similar cracks near the center of a 12-foot traffic lane

defects involving wheel loads



Figure 1



Figure 2

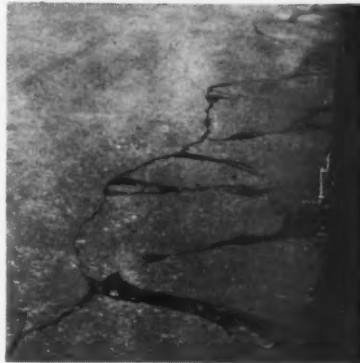


Figure 3



Figure 4

defects not involving wheel loads



Figure 5

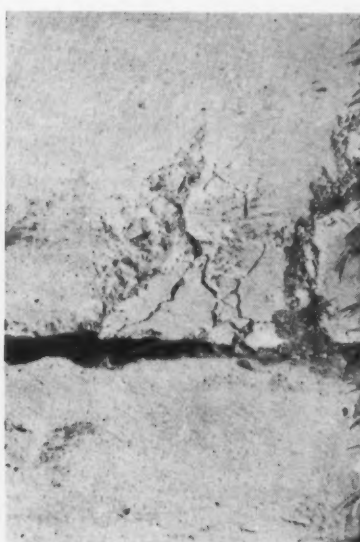


Figure 6



Figure 7

(Figure 11) are more likely to be caused by serious loss of subgrade support near the edge of the pavement. In this case wheel loads are often a contributing factor.

When there is expansion restraint, near the outside edge of a pavement short longitudinal cracks may tree out from transverse joints (Figure 12). The restraint and the resulting splitting action may be due to the presence of a plug of concrete in the joint space near the edge of the slab. Frozen dowels may also be a factor in this type of cracking.

herringbone cracks

These multiple diagonal cracks are usually caused by heaving of the slab, due to expansive subgrade soils, frost action (Figure 13) or careless mud-jacking (Figure 14). Applied loads are not in any way involved in this type of pavement defect. END



Figure 8



Figure 9



Figure 10



Figure 11



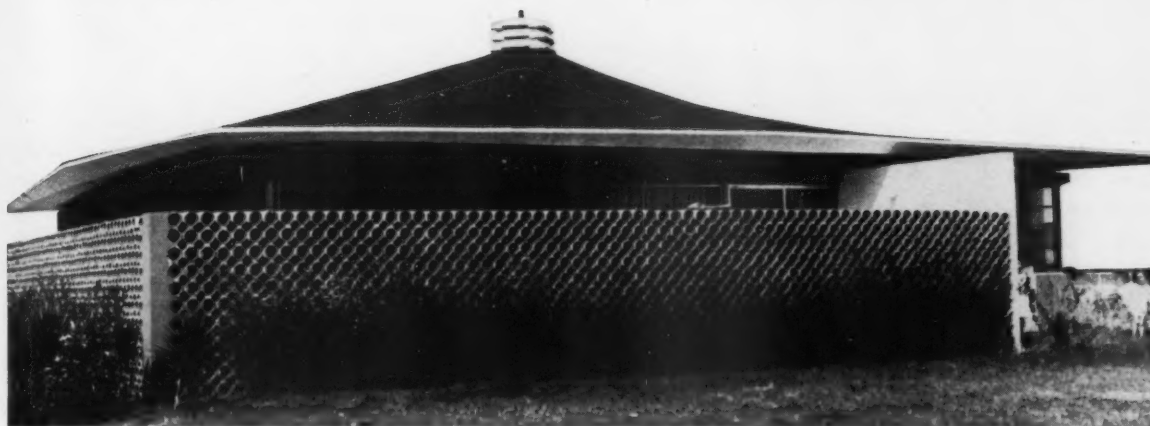
Figure 12



Figure 13



Figure 14



First of architect Duane Conner's paraboloid roof design built in Oklahoma City by Harold Hessel was the umbrella type, with one center support.

MORE HOUSE FOR LESS

Paraboloid roofs

invade home field

Umbrella type paraboloid nearing completion shows single roof support as seen over partition wall. Support will not be visible when enclosed by storage area.



concrete construction / december 1959

CONCRETE PARABOLOID* shell roof houses are being built in Oklahoma City, giving a lifetime home, more living space for the money, great variety and flexibility of design, complete freedom of interior arrangement, lower heating and cooling cost, and minimum investment for maintenance and insurance.

Architect Duane Conner points to time, labor and materials saved in the site-placed concrete house; to the trades eliminated, to cost per square foot which remains the same as span increases.

Builder Harold Hessel is completing his sixth shell roof house, and he says they are selling faster than his conventional houses. A developer has inquired about 100 such houses.

One being completed has 1250 square feet of living space, 1500 with garage, also under shell; three bedrooms, a bath and a three-quarter bath. Selling price is \$14,500. On one of similar design and same size, already occupied, FHA has given an appraisal of \$15,750. Quoted insurance rate is \$10 a year.

Since strength is obtained by virtue

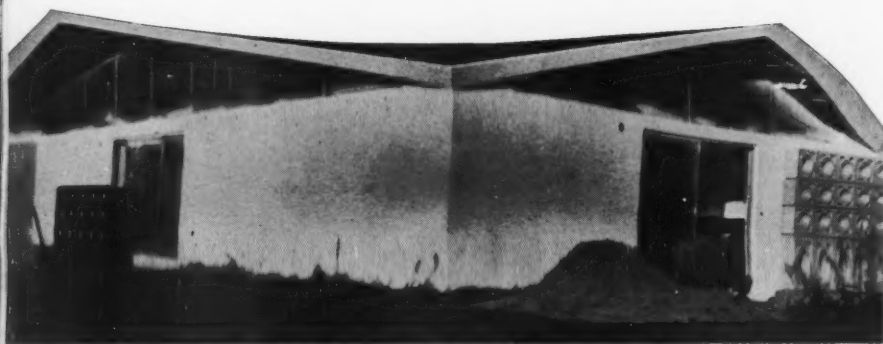
of shape alone, the roof eliminates expensive masses of material. Conner points out that stresses are so low only a bare minimum of concrete and steel are necessary.

Two general designs of roofs have been built: an umbrella roof, supported at only one center point, where the load is about 72,000 pounds; and houses supported at four corners, where each bearing point takes about 18,000 pounds.

The concrete column supporting the umbrella roof is an 18- by 18-inch square, with four No. 8 steel bars, and a stirrup that goes around it on 12-inch centers. Concrete is 12 inches thick in a 4-foot square at the top of the center supporting column where all steel crosses over. No. 8 bars form ridge beams. Under the umbrella roof, a 3/4-inch standard pipe is used on four sides from top of walls to roof, to stabilize only.

Steel used in the roof is controlled by the building code, which requires bars to be not more than three times the slab thickness apart. So the 3/8-inch bars had to be not more than 9 inches apart, since the roof shell is 3 inches thick. "We really don't need that much," Conner said. "The roofs average about 1 pound of steel per square

*See "The Hyperbolic Paraboloid," Concrete Construction, January 1959, page 1.



One of Conner's paraboloid designs being completed by Hessel showing roof supported at four corner piers only, leaving complete interior freedom. Glass is used all around between walls and roof.

foot of roof area," he added.

"Three inches is as thin as you can go on the roof under building codes," Conner continued, "and this will take you up to a large span. And it is a practical move not to make the shell too thin, because the less concrete you put in the more insulation is required, and insulation costs more."

Four No. 6 bars are used in each of the outside beams. Outside edges are built up, as gravel guard, and slant of roof keeps water from running off except out through bottom of wall in four corner drains.

Four ¾-inch No. 6 bars are used in the corner supporting columns. Piers are 24 inches, built out to 36 inches at the bottom.

The foundation system is cheaper than conventional. No forms are required for piers. The builder always goes deep enough to be sure of what he has on weightbearing piers. Average is around 10 feet deep for pier foundations. Piers are set on 8-foot centers.

Walls (non load-bearing) in average soil rest on light piers, one every 25 feet, not over 12 inches in diameter, with one No. 5 bar.

The wall pouring system has been evolving. First Hessel cast two walls at the same time, with air space left between. Then he poured two walls with insulation board equalized in between the walls. Four No. 9 bars are used in the top 6 inches of the wall, forming a continuous cap, tying the four gable corners together. Glass is used in areas between top of walls and roof.

Foam concrete is to be used for walls, which will be 5½ inches thick instead of 7¼ inches. This will save

concrete, insulating board and one mat of steel. The wall can be placed on the floor slab and marble chip used to make a permanent colored outside surface. Then the wall will be tilted up into place.

Conner says the basic requirement of the paraboloid roof is exceptionally careful structural design, rather than costly specialized skills or equipment in the field. "It's very easy to lay out. Everything is formed with straight lumber."

Visualize a section of the roof as a warped quadrangle—one corner raised or lowered. The hyperbolic paraboloid is divided into equal parts by 2- by 4-inch stringers. Centers are broken down until they are close enough together, then supported as needed. About six feet can be spanned by 2 by 4's, placed about two feet apart. Plywood is used for pouring surfaces, since this material conforms readily to a curved surface, and is a reusable item.

Conner advises against permanent form board for houses. He recommends a removable wood form and the use of an insulation ceiling such as sprayed asbestos.

Lightweight Haydite concrete is placed on the roof by crane, one cubic yard of concrete covering about 80 square feet. It takes two hours to place the concrete. The cost of the shell tends to be lower than the slab because a lighter weight is supported with a 3-inch shell, and the warped surface does not offer the problem of leveling and alignment.

In the curing process a rubber hose with yard sprinkler is placed on top of the house and water runs for two or three days. Hessel leaves forms up

for 7 days.

Built-up roofing has been used so far, but Conner says if the builder plans for it he can use plastic resin coatings instead, giving variation of color, saving money, and achieving permanence at least equal to built-up roof.

House styles can be varied more than conventional buildings, Conner

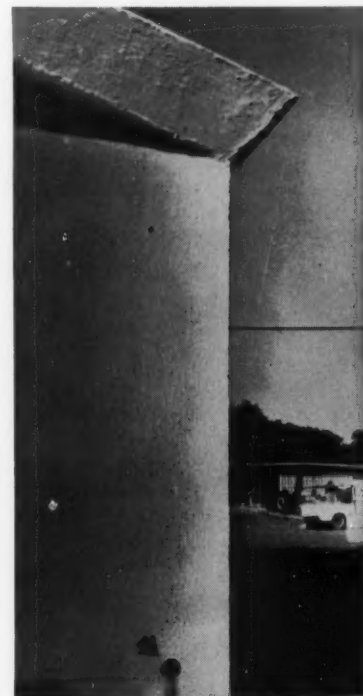
points out. "In the conventional you have a choice of gable or hip or variations on these. In the concrete parabola you have a great choice of shapes. Wall finishes are not limited to the red or buff of brick. You can get

almost as many variations as with paint. Developers could get more variety and at the same time more harmony in large developments than in conventional housing.

"Freedom of design is terrific, keeping in mind that the shape of the house has to be simple—rectangular or square."

Key to economy is the simplicity of the house, and everything is tailored to the simplest type of operation on the job. END

Built-up edges keep water from running off paraboloid roof. Drainage is through wall openings (arrow) at each of the four corners.





Camera goes wherever superintendent

Ray Snyder goes. He uses a twin-lens reflex type camera—economical both to own and to operate—to obtain picture records in connection with all jobs of L & M Paving of Miami.

When it comes to heading off

those nuisance suits which are often

so costly and time consuming for contractors . . .

ONE PICTURE

IS WORTH A THOUSAND WORDS

One of a series of pictures taken to show how scaffolding, equipment and workmen of other sub-contractors prevented L & M from starting a sidewalk paving job. Curbs in lower left of picture, with forms still in place (arrow), indicated L & M was keeping up with the job as much as working conditions permitted and that they could not be held responsible for any delay in the completion of the sidewalks. Availability of this photograph, bearing date, time and location of job, prevented any possibility of dispute.



A PROTECTIVE PHOTOGRAPHIC FILE, potentially worth many thousands of dollars, has been compiled by L & M Paving of Miami, Inc. Ray Snyder, the firm's general superintendent, who developed the plan, does the photography in connection with his regular supervisory activities, using inexpensive equipment, and the program costs little—literally a few pennies a day.

Use of photography by contractors is not unusual for keeping a pictorial history of job and/or out-of-routine work. This Mr. Snyder does too, but his basic plan is entirely different—he wants a pictorial record of any activity of the firm or any development which might later become an issue in a dispute, a lawsuit or a question of contract performance. Most of the pictures never will be used, but they are kept in a safe, ready to be called for in event a dispute should arise.

For instance, L & M Paving had a contract to put in sidewalks and gutters around a new bank building. The general contractor was handling the work under a contract which called for



On a contract to pave a parking lot, L & M Paving encountered this drain field, with its questionable supporting strength. Photos were taken to show this to the owner, who had guaranteed the soil base as adequate for a parking lot. Work was halted in this section until the owner had the drain field repaired.

Forced to excavate close to an existing building, L & M foresaw the possibility of being subject to some future legal action should the building settle. This is one of a series of pictures taken at the job site to show that no caving had occurred around the foundation of the existing building.



penalties if the job was not completed within a certain time, and he had set dates for each of his sub-contractors to do their portions of the job.

L & M was able to put in the curbs and gutters on scheduled time. But 10 days after starting work the company was forced to halt because other sub-contractors were in the way. Mr. Snyder took pictures of scaffolding, trenches and workmen of other firms in the construction area where L & M was supposed to put sidewalks (see photo). The photos showed it obviously was impossible for L & M to maintain the schedule set by the general contractor and thus should not be held liable for any delay which might have resulted.

On the back of a print of these pictures, Mr. Snyder wrote the pertinent data: his name, as photographer, the date and time, the location of the picture, and the job. Largely because of the availability of this excellent evidence concerning conditions at the job site, the general contractor put no blame on L & M, but should a dispute have occurred, the photographs would have provided an excellent defense.

At another time the company had a contract to pave a parking lot under an agreement which said the owner guaranteed the soil base as adequate. When the company began the work, it found a drain field of questionable supporting strength underneath. Photos were made of this and a report was



This photo promptly canceled an \$800 damage claim. The use of a man in the photo showed the approximate distance between the storm sewer (on left) which L & M was laying, and the house sewer lateral (under man's hand on right, arrow), which the owner claimed L & M had damaged. The claimant took one look at this photo and dropped his suit.

made to the owner. After he had the drain field repaired, L & M finished the job. The photos gave L & M a pictorial history of what had happened on this job in the event of any future legal action.

Occasionally photography is used in maintaining good working relationships with inspectors. Recently the firm was ready to place a footing on a municipal job, but the inspector failed to show up for the scheduled pre-placing inspection. Mr. Snyder took a photo of the forms and the reinforcing steel in place and ordered placing to proceed, relying on the photo to show the inspector that the job was prepared properly. Here was an instance where the saving from the photography program was tangible because job delay was eliminated.

Intelligent use of photography seems to be an outstandingly effective way of keeping disputes out of court—an achievement which saves money and time for everybody. One instance of this occurred when a property owner claimed L & M Paving had damaged a house sewer lateral when it laid a storm sewer line on his property. He filed an \$800 claim. But Mr. Snyder had the foresight to take a picture on this job. As may be seen in the accompanying reproduction, it showed the location of the two lines, with a man posed between them to indicate how L & M paving had off-set its line to avoid damage to the claimant's line.

The claimant took one look at the picture and dropped his suit.

In another instance the company used photographs to support its own claim against a pipe manufacturer for faulty pipe. Mr. Snyder took pictures of the work involved in removing and replacing the pipe, showing the depth of the excavations, the extent of the job and so on. Relying on the evidence of these photographs was a claim for nearly \$9,000.

Every contractor working on public streets faces the constant threat of lawsuits. Recently a motorist, obviously not long from a cocktail lounge, ran through a street barrier at the scene of one of L & M's excavations. Mr. Snyder was on the job early in the morning with his camera. He photographed the barrier, flares and warning signs as they had been set by the crew the evening before. His pictures showed the scene, with the barrier slanting after being broken by the car. No claim was ever filed in this incident, although the driver at first threatened to do so.

Of course, photography will not protect the firm from damage loss if the firm is at fault. In preparing for a job along a residential street, the company had to cut back overhanging tree branches in order to get its equipment close enough to the job. The workmen made a miscalculation and cut the branches back inside a homeowner's property line. He claimed

damages, and the company had to pay. However, Mr. Snyder took pictures just the same. He felt this would be lasting proof of the amount of damages which might be claimed.

On another project L & M had to excavate close to an existing building. Mr. Snyder wanted to protect the firm from a possible future claim that such excavation had weakened the foundation of the building. He took a picture of the excavation (see cut) and posed a man between the building and the excavation. It showed no caving and would tend to prove there was no weakening of the soil around the footings. Any claim which the company might expect from this particular job would not be immediate, but might occur years hence should the building settle.

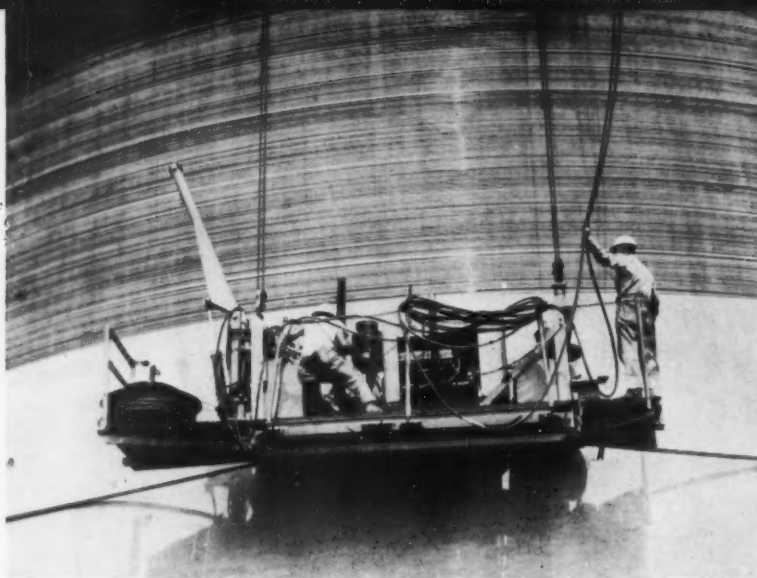
The photography involved in a program like this is simple enough. To make the plan effective, however, the executive must train himself to think in terms of when and how a photograph might be of value, and he must take the time to make the pictures.

Mr. Snyder has used two types of cameras. He started with a 35-millimeter camera. Currently he uses an inexpensive twin-lens reflex camera (cost around \$25). This type allows the operator to see through a focusing lens and ground glass exactly what he will have in the completed picture, and permits him to get a sharp focus. It is small, uses small film (3¼- by 3¼-inch negative) and is relatively easy to operate. A light meter to determine light conditions and a flash outfit are the only accessories he uses. He does no processing, preferring to send film through a drug store to a commercial processing laboratory.

Mr. Snyder has picked up numerous photographic pointers by reading manuals obtainable at photo stores. He always takes two exposures of any picture, thus being reasonably sure of getting at least one good picture. When he receives his prints back from the photo shop, he puts the pertinent data on the back of the print. Negatives are kept in a safe, like any valuable document, always ready for call when needed.

He uses the camera, too, to make personnel pictures, as well as to make pictorial records of big or unusual jobs. But first in his mind is that the camera, when used effectively, can be an important and valuable legal lifeguard.

END



prestressed concrete standpipe

A 2,950,000-gallon prestressed concrete standpipe in Sayreville, New Jersey, measures 122 feet high by 65 feet inside diameter. The tank was built by the slip form method and for the first time forms for the dome were carried up with wall forms. The standpipe was prestressed by wrapping the wall and edge of dome with high-

tensile wire, the wire being stretched as it was applied. It thus exerts an inward force which will counteract the outer force exerted by tank contents when in use. The dome is prestressed to withstand lateral dead and live loads of the dome itself. Prestressing wire was applied by a wire-winding machine suspended along the side of the

tank from a carriage which rode the outer edge of the dome.

In employing the slip form method, forms approximately 4 feet high were elevated an inch at a time as placed concrete hardened, in readiness for the next pour. Twenty-four arched trusses for the dome form radiated outward from the center of the structure to the slip forms. Twenty of the trusses were of the bow string type with tie rods at the base, whereas 4 were regular trusses of wood strut construction. The 4 wood strut trusses were arranged to form 90-degree quadrants and 5 bow string trusses were equi-spaced within each quadrant. The tie rods of the bow-string trusses terminated at holes in a 36-inch diameter steel plate at the center of the structure. The arches of these trusses terminated at the center at wood hypotenuses of the 90-degree angles made by the 4 main trusses. The bow strings were bolted to the arches at the slip form ends. The trusses rested on the wales of the wall forms, the dome sheathing being sufficient to keep them erect.

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"Concrete of uniform high flexural strength is essential to allow early lifting of the slabs without cracking. Early lifting provides significant savings in construction costs.

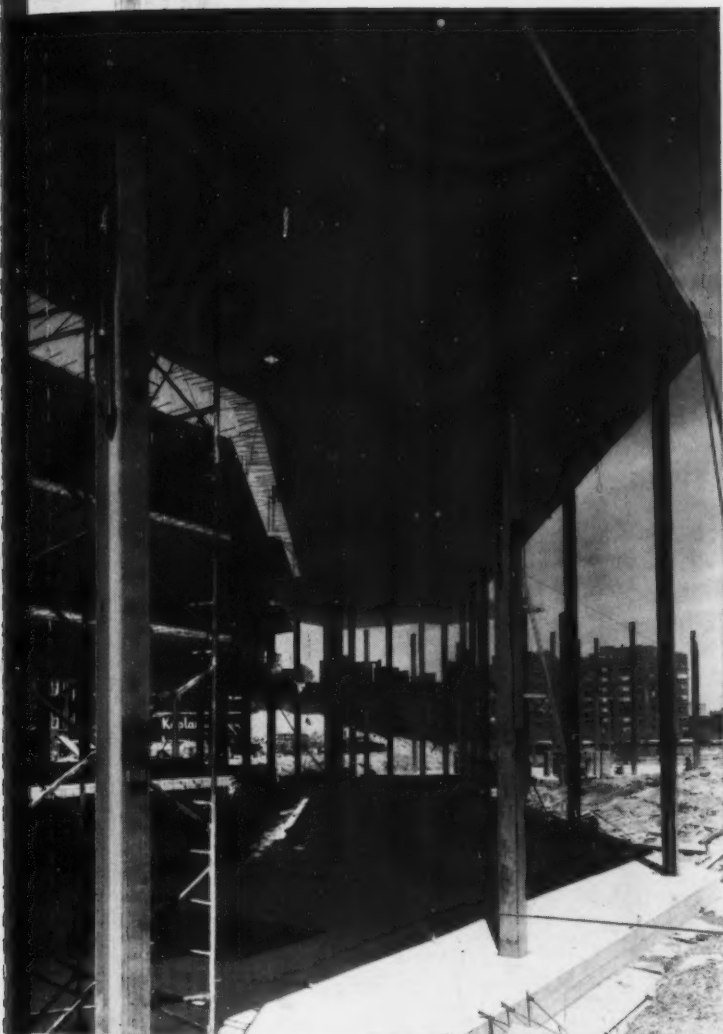
"The specifications called for concrete of 3000 psi at 28 days. Our past experience with POZZOLITH, confirmed by our ready-mix supplier — Material Service Corporation—indicated their POZZOLITH concrete would easily meet the specifications and would also provide the high flexural strength needed for early handling.

"We raised the roof one week ahead of schedule ... and in 80,000 square feet of lift slabs there was not one crack.

"We're very pleased with the economies and excellent results—and we know that POZZOLITH helped us do a better job ... faster, for less ... at 'Holiday Lodge'."

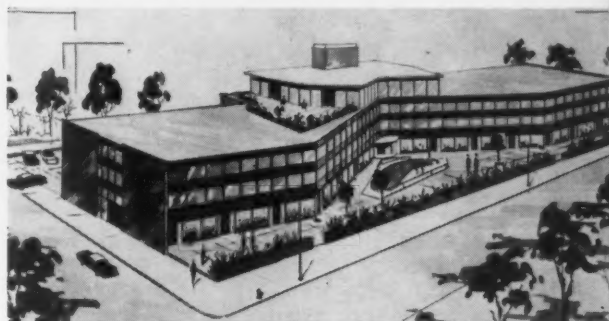
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FIRST MULTI-STORY LIFT-SLAB PROJECT in Chicago—The "Holiday Lodge" motel—required 16 concrete slab sections, each 8" thick. A total of 80,000 sq. ft. of slab was lifted in only 2½ weeks. Concrete strength tests—made by H. H. Holmes Testing Laboratories—consistently ran from 3500 to 4000 psi at 7 days.

LIFT-SLAB CONSTRUCTION ... all roof and floor slabs are placed and cured individually at ground level—in a "stack". Individual slabs are then raised to desired height by hydraulic jacks.



"HOLIDAY LODGE" ... architect's sketch of new \$1.5 million, 100-unit Chicago motel. Architect: Louis I. Simon • Consulting Engineer: Paul Rogers & Associates • Lift-Slab Contractor: Great Lakes Lift Co. • General Contractor: Kaplan Contractors, Inc.—all of Chicago.

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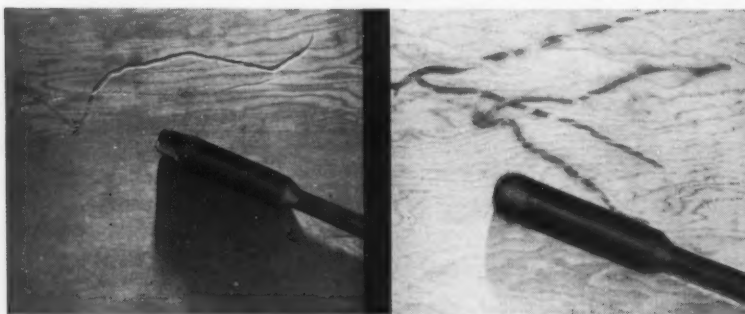


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Protection From Moisture for Slab-on-Ground Construction and for Habitable Spaces Below Grade. Report No. 15 to the Federal Housing Administration. By the Building Research Advisory Board, Division of Engineering and Industrial Research. Prepared and edited by William S. Brown. Publication 707. Published by National Academy of Sciences—National Research Council. 2101 Constitution Avenue, Washington, 25, D.C. 66 pp. Illus. \$1.50.

The Building Research Advisory Board, under a contract between the Federal Housing Administration and the National Academy of Sciences, was asked to make recommendations concerning the moisture protection needed for slab-on-ground construction both at and below grade level; and to provide information useful to the FHA in establishing standards and identifying needed research. This report presents the findings of the Board.

Four distinct yet closely related elements were studied: (1) the building site—soils and grading; (2) on-grade slab construction; (3) habitable spaces below grade; (4) service life of a vapor barrier. The report gives recommendations, and supporting information on these four elements. Appendices describe field investigations and other pertinent data.

Writing and Publishing Your Technical Book. Published by F. W. Dodge Corporation, 119 West 40th Street, New York 18, N. Y. 50 pp. Free of charge.

This book is written to help authors of business, professional, or engineering books organize and develop their ideas to the point where they can obtain the support and backing of a publisher. It answers a great many questions about the author-publisher relationship, and it also presents many practical checklists for preparing material for publication. Any prospective business or technical author would find the book helpful.

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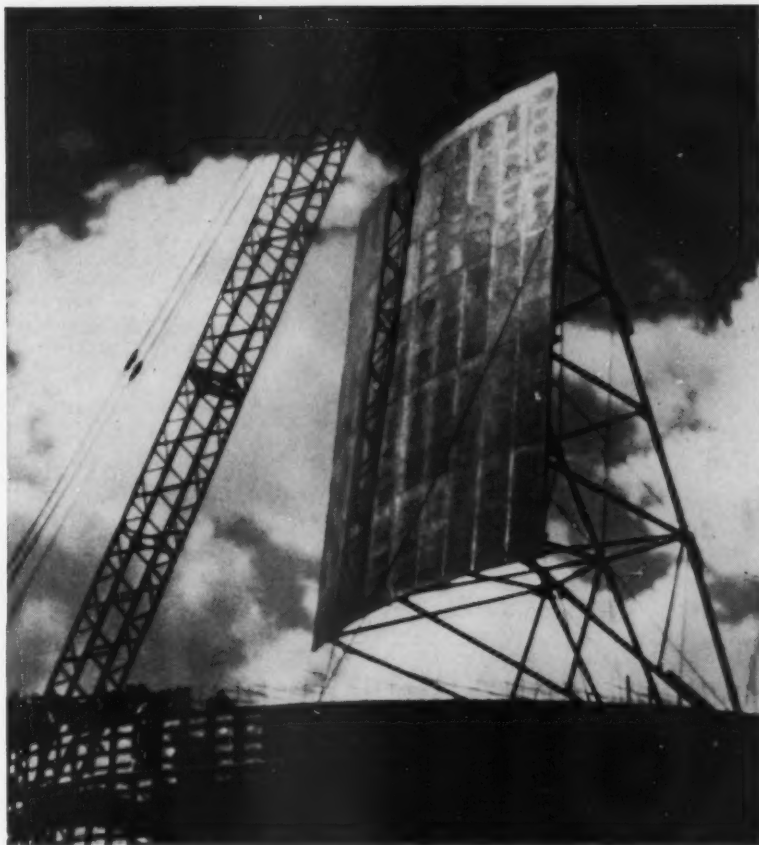
Weight 5 Lbs. Per Square Foot

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37,000 square feet of steel-ply forms used on the Air Force Academy, Colorado Springs, Colorado.



CIRCULAR WALLS were formed by ganging steel-ply forms. Four ganged sections 22' wide by 28' high were used to pour a third of the sewage treatment tank at one time.

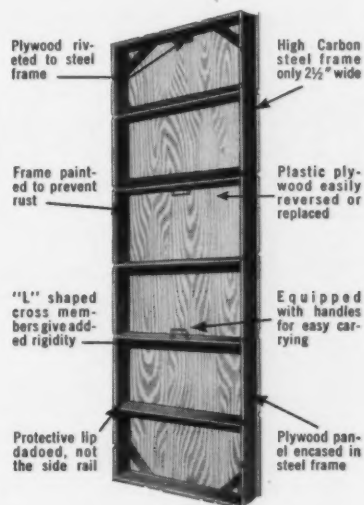
nomical for your particular job. For rough work where appearance and break-back are not important you can use the Symons flat tie. When clean-cut foundations and easy positive break-back are required, Symons Steel Rod Ties with 1" break-back are the answer. And, for special gang forming, Symons She-Bolt Ties with 1½" break-back are available.

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letters

air entrainment and concrete Sir:

I just read your October issue of CONCRETE CONSTRUCTION MAGAZINE from cover to cover.

In the article on "Air Entrainment and Concrete" I noticed some inaccuracies in the section on tremie concrete on page 4. I refer to the following paragraph: "Along with these advantages come a number of drawbacks,

including non-uniformity, high slumps . . . high cement content . . . the use of air entrainment has been found to reduce all of these complaints. The greater cohesiveness and workability of air entrained concrete results in greater uniformity and less segregation. Slumps can be reduced and the formation of laitance is greatly retarded. Since the cement content can be reduced, internal heat caused by hydration is lessened."

These particular claims appear to be almost the same as the test results

which were reported in my article "Tremie Concrete Controlled with Admixtures" which appeared in the February 1959 issue of the ACI Journal. In this case, however, both Plastiment (retarding densifier) and Sika AER (air entraining resin) were used.

A separate set of tests was run with air alone and results were not much better than for plain concrete.

The air entrained mix was fatty and cohesive and there was little tendency for segregation. However, without retardation, the flow and slopes were not improved and the laitance formation was only slightly better than that for plain concrete. A copy of the article is enclosed. The following points are of particular importance:

1. **HIGH SLUMPS**—The use of air entraining in tremie concrete does not change the need for using high slumps. High slumps are essential to good flow since gravity is the only force aiding placement of tremie concrete. Good flow is necessary to produce a satisfactory quality of concrete at the perimeter of a cofferdam or other steel form.

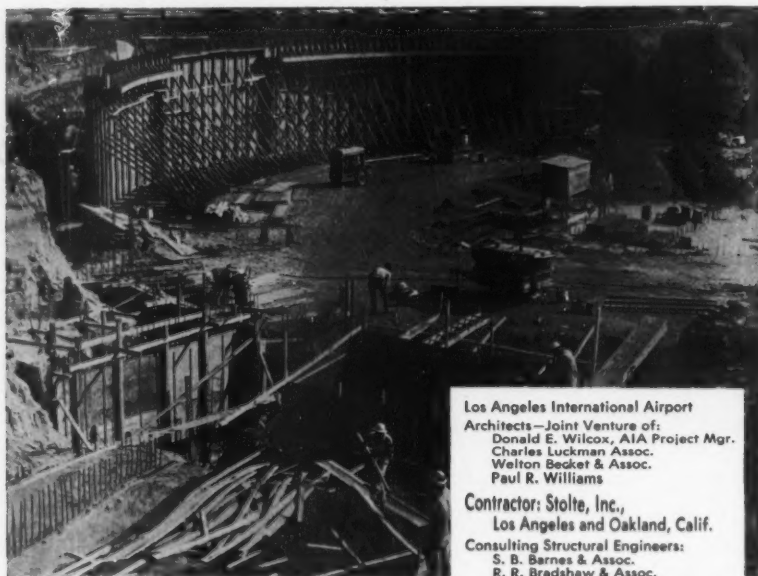
2. **HIGH CEMENT CONTENT**—Air entrainment will not change the need for high cement content since the strength and the uniformity are not substantially improved by air entrainment.

3. **LAITANCE**—Laitance is only slightly reduced when air entrainment is used. The formation of laitance seems to result from the flow characteristics of fresh mix flowing over mix which has partially stiffened, thereby causing some separation of the cement paste from the aggregate. Retardation is essential to reduce laitance.

In my opinion, air entraining should be mandatory in any concrete subject to cycles of freezing and thawing and in any concrete containing less than 4½ bags of cement per cubic yard. Air entraining actually increases compressive strength in the ranges of low cement content since it has the capacity to expand the cement paste volume so that it will coat more aggregate.

I thought this data would be of interest to your readers as they might be very much disappointed if they depended on air entraining alone to produce such an extensive group of benefits in tremie concrete.

J. WAYMAN WILLIAMS, JR.
Sika Chemical Corp.
Passaic, N. J.



Los Angeles International Airport
Architects—Joint Venture of:
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Charles Luckman Assoc.
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Gates System Used On New \$60,000,000 Los Angeles International Airport Facilities

Here is a job that required a truly versatile and low-cost concrete forming system. Versatile because of the wide variety of structures that had to be formed, including: A transformer vault, telephone vault, 140' circular building, ramp retaining wall, cooling tower and miscellaneous pits and foundations. A low-cost system was needed because on a job of this size, equipment and man-hour savings result in compounded profits. These are the reasons Gates was used.

Forming Details

¼ of the 140' diameter circular central utilities plant was formed at one time with 4 reuses of standard ¾" x 4 x 8 and 2 x 8 panels. Center core wall, 30' diameter x 30' high, was formed with double ¾" laminated plywood.

Information designed to help you form better at lower cost is available now. See the "yellow pages" for your local dealer, or write direct. No obligation, of course.



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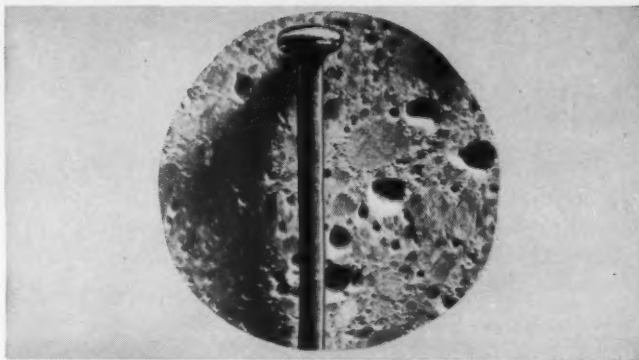


3 points to watch for better winter concreting

1. Plan ahead. Concrete will be delivered at a temperature between 50° and 70°F. Be ready to place at once. Have forms and reinforcing steel free from ice and frost—live steam works best. And, of course, never place concrete on frozen ground. It will settle when it thaws.



2. Specify air-entrained concrete for all jobs—structures and pavements. Resistance to freezing and thawing is greatly increased—freezing water in the concrete has room to expand harmlessly into the air cells. Magnified photo shows size of air cells compared with ordinary straight pin.



3. Provide suitable curing temperatures. Use protective coverings as needed, either with or without moist heat, to keep concrete at 70° or above for 3 days, or 50° or above for 5 days. Protect from freezing for at least 4 days. Rate of cooling concrete shouldn't exceed 1 or 2 degrees per hour.



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concrete**

*Write for free literature on winter concreting.
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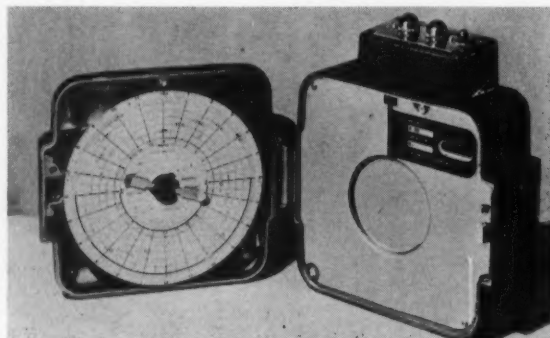
products

For further information use check list on page 31.



job office

Construction job shack made of shatterproof fiber glass reinforced translucent plastic panels is 10 feet wide, 12 feet long and 7 feet high and requires no internal bracing. It may also serve for equipment storage. It weighs approximately 150 pounds and is easily transported on a flat bed truck. When dismantled, it requires very little storage space. The shack may be staked to the ground like a tent or secured to a perimeter of wood 2 x 4's. If more permanent installation is desired, it may be bolted to a foundation. Can be quickly disassembled for shipment or storage. Kemlite Corp.



speed recorder

Designed to aid operators of off-the-road equipment and other rolling stock who are seeking to reduce mounting expenses and capital equipment costs, a speed recorder makes an accurate record of engine speed in revolutions per minute and pinpoints operations on one-day or three-day charts. Because most rolling stock is diesel-powered, the recorder was designed for these units. Models recording higher rpm are available for gasoline engines. Extended engine life is the greatest benefit, but additional cost saving and safety factors make the units of value. Service Recorder Co.

products

For further information
use check list on page 31.

steel stake

Bulletin describes a steel stake and a line of concrete construction accessories and offers further information on various applications of the stake. Dee Concrete Accessories Co.

masonry paint

Vinyl masonry paint requires no pre-wetting of porous surfaces. It can be used on either exterior or interior surfaces and also as a stipple paint. Increased hiding ability often eliminates need for second coat. Mixed with water, the paint can be applied with brush, roller, or sprayer. It is available in white and a number of colors. Carbola Chemical Co.

floor maintenance

Plant and building maintenance men will be interested in an epoxy-based combination skid-proofing and protective coating material now available. It is said to provide excellent low-cost resistance to wear, water, detergents, alkalis, mild acids, oil, grease, industrial fumes and many other reagents. The material welds itself to concrete surfaces, sealing cracks, waterproofing and providing corrosion protection and will also bond to other types of masonry, to steel and to many other building materials. Permagile Corp. of America.

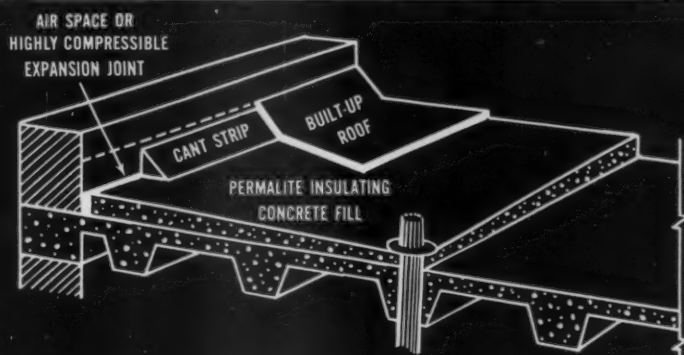
structural sealant

A structural sealant can be used for filling and sealing expansion and contraction joints as well as for waterproofing cracks. It bonds to many types of building materials above or below grade and is unaffected by structural movement. Formulated from specially synthesized rubber and long fiber asbestos, it falls in a category between a good grade of caulking compound and a polysulfide base sealer. It will not run or sag in hot weather or become excessively brittle at low temperatures. It can be applied like caulking and cures in place to form a firm semiflexible seal that fills, bonds, and waterproofs. Klee Waterproofing Corp.

concrete construction / december 1959

Slope to Drain and Insulate
the Roof—both in one

operation with Permalite® PERLITE AGGREGATE INSULATING CONCRETE



CUT COSTS, TOO...no need to steel-trowel the structural concrete deck; just rough-screed it to proper thickness. Permalite Insulating Concrete makes perfect bond.

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PERMANENT—can't rot or decay; termite- and vermin-proof.

ROOFING APPROVAL—All major roofing manufacturers approve properly installed Permalite Insulating Concrete as a base for 20-year bonded roofs.

See your Sweets File, or write for complete information.

PERLITE DEPARTMENT, GREAT LAKES CARBON CORPORATION

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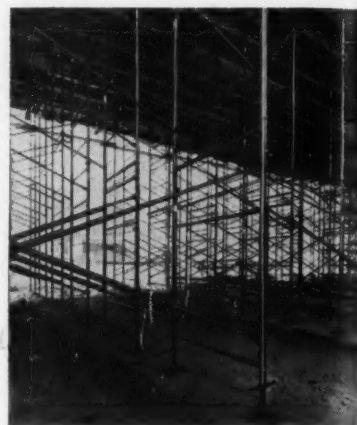
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frost wedge

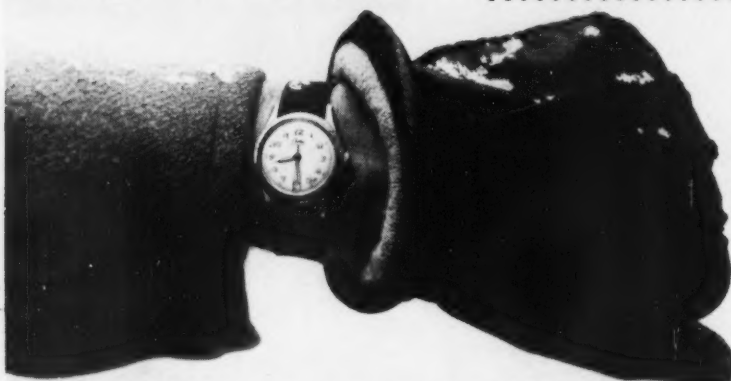
Frozen ground breaks quickly when frost wedge with inclined shape is applied. The tool is supplied in three shank sizes and two wedge sizes. Length under collar on all three models is 17½ inches. Brunner & Lay, Inc.



shoring panels

Waco Hi-Load shoring panels engineered to carry working loads up to 20,000 pounds per panel, or twice the load capacity of conventional steel scaffold frames. Working loads may safely be carried on panel ledgers as well as panel legs. Erection, stripping, handling and transportation costs are reduced. Manufacturer says cost analysis showed that compared to timber shoring, Hi-Load paid for itself on first five uses. Waco Mfg. Co.

Keep on schedule all winter



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with SOLVAY CALCIUM CHLORIDE

Ask your ready-mix supplier to include 2% of Solvay® Calcium Chloride,* with heated water and aggregate, in your ready-mix. Keep close to schedule at any temperature with this "Special-Winterized" mix that . . .

Reduces overtime finishing. Sets faster. **Speeds form removal.** Develops high early strength. **Reduces protection time** up to 50%. **Reduces delay** between operations. **Adds safety** through extra cold weather protection.

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*Speeds but does not change the basic action of portland cement. This use of calcium chloride is approved by Portland Cement Association, American Concrete Institute, Calcium Chloride Institute, leading highway departments.

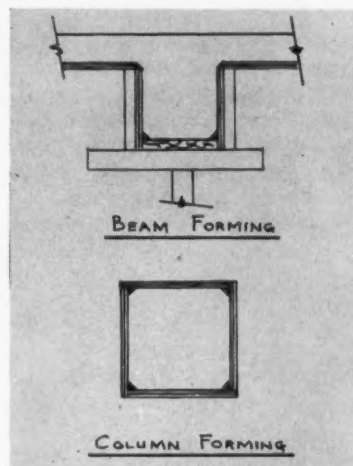
Write for Solvay's 38-p. "The Effects of Calcium Chloride on Portland Cement."



SOLVAY PROCESS DIVISION

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chamfer strip

Chamfer strip for use on all types of concrete forming has special rubber extrusion of proper consistency and stiffness to provide complete flexibility and reusability. Use of strip provides contractors with lowest possible cost and eliminates the problem of grout leakage at chamfer corners. Line drawing illustrates use in column and beam forming. Universal Form Clamp Co.



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The project, which will house Air Force Academy personnel, is made up of single and multiple dwellings. Because heights varied from 3' 4" to 11', Simplex 4', 6', 8', and 10' panels were used. No walers were required! Projects such as this prove once again that Simplex has the edge in the forming field . . . to do a *better job at greater profit!*

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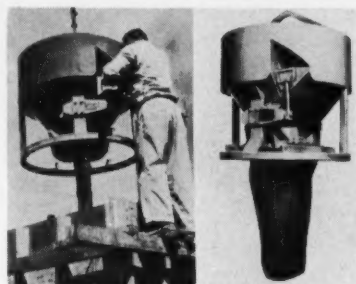
- Long-lasting, 9-ply 1 1/8" plastic impregnated plywood . . . outer plys won't peel.
- Heavy-duty steel backing bars run full width of panel to give added strength. Steel butts against steel as forms are locked together.
- Exclusive, patented locking levers. A tap secures or unlocks them . . . cam action pulls them together.
- Tie wires slip into position easily . . . break off cleanly.
- Lightweight panels! A 2' x 8' panel weighs less than 70 lbs. Easy to set, strip, or load.



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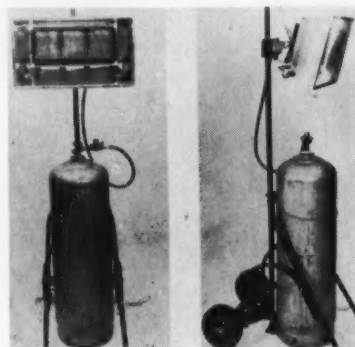
products

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concrete bucket

Geared discharge handle on this lightweight concrete bucket provides ample leverage with a short stroke. One-handed gate operation is possible on all five sizes (1/2 to 2 cubic yards). Bucket has been designed with all working parts above discharge point to protect them from falling materials. Fifty degree slope of cone shaped bucket assures complete discharge of medium slump concrete. Thirty-six-inch rubber discharge spout is available. C. S. Johnson Co.



radiant heater

Operated outdoors or in on bottled propane gas, an infra-red radiant heater produces sunshine-like warmth at low cost. Rays can be concentrated on specific areas by polished parabolic reflectors without heating the surrounding air. Workmen, tools and material remain comfortably warm even at temperatures below zero. Heaters are available in 3 sizes. Easily wheeled anywhere on the job by one man, they can be used for spot heating, thawing, curing, drying or baking. Perfection Industries, Div. of Hupp Corp.

products

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prestress strand

Stress-relieved strand with uniform mechanical characteristics is now being produced by an induction heat treatment method. The combination of preforming the individual wires as they are stranded and this method of stress-relieving yields a strand which permits ease of handling and is free from undue wildness, according to the manufacturer. Bethlehem Steel Co.

STOP LEAKAGE with SIKA QUICKSETS

SIKA No. 2

... for high pressure leakage thru concrete in deep basements, tunnels, shafts and foundations. Mortar will set in 15-30 seconds - forms plug that bonds tightly. Will not wash away.

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OTHER SIKA QUICKSETS

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For Fast Setting Air
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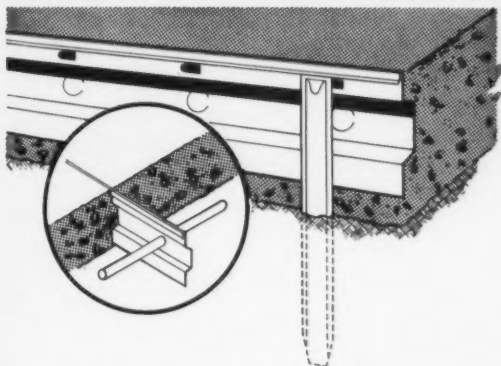


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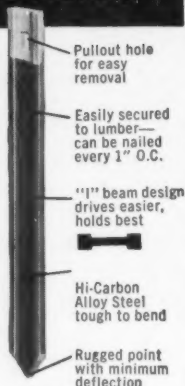
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polyethylene sheet

Seamless 40-foot wide polyethylene sheet in thicknesses up to 6 mil in standard rolls of 100 feet long is available in natural-clear and black. Longer length rolls are obtainable on special order. Seamless construction makes this sheet especially suitable for enclosing or covering large structures and areas. Used as a blanket for curing of concrete, the sheet is sufficiently wide to cover three lanes, plus shoulders, of newly-laid highway pavement. Gering Plastics Div., Studebaker-Packard Corp.

white portland cement

A new 24-page descriptive catalog on the many uses and applications of Atlas white portland cements in building construction and products manufacture includes information on white portland cement in architectural concrete, terrazzo, cement stucco, highway reflecting curbing and markers, cement paints, masonry mortar,

swimming pools, light-reflecting floors and cold-glazed wall finishes. Universal Atlas Cement Div., United States Steel Corp.

plastic traffic marking

An extruded vinyl strip can be used for highway center and border lines, street intersections, railroad crossings, crosswalk marking, school zones, parking lot zoning, airport safety marking and industrial traffic areas both in plant and outside. The material is a lasting replacement for the quickly fading painted lines now in use and is said to be the most economical long term method of road marking. The self-cleaning material, available in several colors, has a pebble finish created by glass beads incorporated in the material, to furnish both a non-skid and a reflecting surface. It retains color and is resistant to oil, snow melting materials, grease, acid, water, snow and ice. Auburn Plastics, Inc.

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Vibro-Foil's controlled expansion properties counteract shrinkage in concrete and mortar to produce a dense, strong grout with an elasticity that helps it to withstand impact, pounding action, side thrust or torque. It's the ideal grout for all structural iron and steel work.



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Typical WELD-CRETE Applications



GRANVILLE ST. BRIDGE, VANCOUVER, BRITISH COLUMBIA—One of the largest 8 lane bridges in North America. Here Weld-Crete was applied to bridge surface to bond cement dividing strips. Now, over 4 years later, bonds are as good as new. General Contractor: Dominion Bridge Company.



SEVEN CORNERS SHOPPING CENTER, FALLS CHURCH, VIRGINIA—During construction of this 600,000 sq. ft. structure, initially only part of floor was poured and floated to a smooth finish. Areas in which show windows would be added were poured as base slab only. Slab was coated with Weld-Crete. After store fronts were custom-built, delayed toppings of 1" to 1½" thick were poured with assurance of permanent bond to base slab. These toppings were then finished with asphalt tile, wood, or finish flooring of lessee's choice. Designed and constructed by The Kass Realty Co. of the Kass-Berger Organization under direction of J. Franklin Groff. Concrete Contractor: Moses-Ekco.

products

For further information
use check list on page 31.

testing equipment

Bulletin 26 pictures and describes a line of concrete testing equipment including cylinder molds, slump cones, concrete tester, Kelly ball, concrete thermometers, and other testing equipment. Humboldt Manufacturing Co.

caulking compound

Applied by gun or knife, a caulking compound based on DuPont Hypalon cures into a resilient, rubberlike material said to be unexcelled in adhesion, weather-ability and resilience. It is a one-part curing system and is used directly from container without mixing. Available in a wide variety of fast colors from pure white through the deepest shades. Standard containers are one and five gallon pails. West Chester Chemical Co.

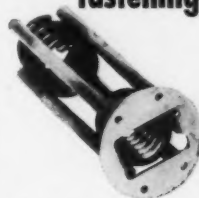
anchoring handbook

Revised, enlarged edition of "Masonry Anchoring Handbook," indexed for easy reference, has been prepared for architects, engineers and users of masonry anchors and drills. A complete source of information on masonry anchoring, the 48-page handbook includes tables that show the proper anchors to be used with each type of fixture and material. Anchoring and care and use of masonry drills are described and pictured. Dimensions and specifications are given for each type of anchor and drill. Rawlplug Co.

measuring wheel

Accurate and dependable measurements from a measuring wheel that can be rolled over even the most uneven terrain can be obtained by use of a precision-calibrated instrument for outdoor measuring jobs. Of particular interest to contractors and engineers, the measuring wheel can be operated by one man, registering measurements to ½ inch on one side of the disc wheel and tenths of a foot on the other. One man can roll it along up to 100,000 feet, or it can be operated from car window when driving at low speed. Rolatope, Inc.

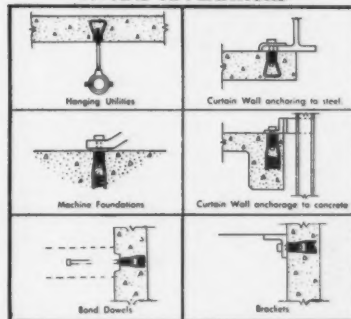
New Richmond Structural Concrete Inserts With sufficient strength and safety for permanent fastening to concrete.



Available in ½" to 1½"
diam. in strengths to
65,000 lbs. in 3,000
psi concrete

The new Richmond Structural Concrete Inserts are prefabricated from a special design which distributes the bolt stresses into the concrete for greater strength than any previously known device. Certified tests of these units in concrete at 3,000 p.s.i., verify this claim and permit design engineers to approach the problem of fastening appurtenances to structural concrete with greater security than has been possible in the past.

TYPICAL APPLICATIONS



The new Richmond Bulletin on Structural Concrete Inserts gives you complete information about these inserts and their varied uses. Send for it and the Richmond Handbook showing the full line of Tying Devices, Anchorages and Accessories for concrete construction. Write to:



RICHMOND SCREW ANCHOR CO., INC.

816-838 Liberty Ave., Brooklyn 8, N. Y.
or 315 South Fourth St., St. Joseph, Mo.

Dodson's Digest



Disappearing Act

"O.K., Dodson, here's your chance," the voice said.

"My chance for what?" I replied.

"To prove how good that Calcium Chloride is you're always talking about—if you can arrange to get a two weeks' supply out to me fast. We're seven miles west of town trying to finish up the new superhighway before there's a foot of snow on the ground."

That was a phone conversation I had a few weeks ago. The caller was Frank McKettrick, a fiery young contractor with a reputation for finishing highway paving jobs way ahead of time. On impulse I decided to ride out with the supplier's truck and we found Frank walking the finished part of the road on an inspection tour. "Getting colder, Frank," I greeted as I stepped out.

"Your Calcium Chloride better work, Dod," Frank answered, "or I'm up a creek—a frozen creek. This cold snap is putting me more and more behind schedule every day."

"Calcium Chloride will put you back on schedule, Frank," I smiled. "It'll reduce your initial and final set time by almost two-thirds. That means a shorter protection period. And it will give you higher early strength, too."

Frank thanked me and jumped on the running board of the truck. "The mixer's up there," he snapped to the driver, and in an instant they were speeding toward a jumble of men and machinery about two miles down the road.

"Frank will finish up fast, now," I said half aloud. Then, from long habit, I reached in my pocket for my car keys—and froze. "The truck!" The words caught in my throat as I watched my ride back to town become smaller and smaller. It was fast walking, but I reached the truck as the last bags were unloaded . . . tired, but definitely not cold.

—L. D. DODSON

P.S. Send, today, for your free copy of our booklet, "How To Make Better Concrete Products and Ready Mix." Just address a card to L. D. Dodson, Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.

Wyandotte
CHEMICALS



MICHIGAN ALKALI DIVISION
HEADQUARTERS FOR CALCIUM CHLORIDE

products

For further information use check list on page 31.



hopper

A 41-cubic-foot capacity floor hopper is said to provide maximum efficiency in handling concrete. A riser is available which increases capacity to 61 cubic feet. Also available is a fitted lip which gives extra reach from building and permits use of poop deck, a combination platform and self-dumping concrete bucket as shown in the picture. Hopper is available with either a 33-inch or 41-inch deck-to-gate height. Overall height is 8 feet or 8 feet 8 inches. Buck Equipment Corp.

post-tensioning system

Folder 3547 explains the advantages of prestressed poured-in-place concrete tensioned by Prescon system of post-tensioning in modern construction. It evaluates the factors of material, flexibility, labor and general costs in producing low cost, high utility modern buildings using this system. Various examples of buildings under construction and detailing of tendon and transverse slab steel in place on a job using plywood forms are shown. Prescon Corp.

color card

Color card illustrates 24 shades of cement colors. Material may be used as integral color or dusted on surface of wet concrete and troweled until uniform color is obtained. Suggestions for use are included. Landers-Segal Color Co.

curing blanket

A white plastic-coated reinforced paper for curing concrete highways and airports is said to combine the best features of reinforced paper curing and plastic curing into one product at no additional cost. The combination of tough, reinforced paper and plastic coating means maximum reuse performance, better moisture retention and easier handling according to the manufacturer. American Sisalkraft Corp.

linear adding machine

Pocket sized adding machine for contractors, engineers and architects provides automatic addition and subtraction of dimensions expressed in feet, inches and fractions as low as eighths. Machine has separate addition and subtraction columns with clear disposition of figures. It automatically converts inches into feet, fractions into inches. Alexander Drafting Equipment Co.

<p>dee</p>	<p>SOLID STEEL STAKES</p>
<p>SIDEWALKS CURBS DRIVEWAYS FOOTINGS</p>	
<p>The only Stake with a spiral arrangement of nail holes providing 24 prelocated nail entry points insuring a positive nailing position regardless of stake rotation and it drives straight in any ground.</p>	
<ul style="list-style-type: none"> • Set up forming 10 times faster • Reuse 100 times • 12, 18, 24, 30, 36, 42, 48" lengths 	
<p>dee CONCRETE ACCESSORIES CO. 670 N. Michigan Ave., Chicago 11, Illinois</p>	

Check boxes below and on next page for information on products described in this issue

See mailing instructions on next page.

☐ **abrasive concrete**

A simple, inexpensive method of making concrete surfaces non-slippery is by the use of abrasive grains which will resist the wearing action of traffic for year. After the surface of the concrete has been floated and troweled once 25 to 40 pounds, depending upon specific needs, is evenly sprinkled on 100 square feet of plastic concrete surface during the finishing and worked into the surface. Available in iridescent black for sparkle finish and in a non-discernible blackish-gray which is recommended for commercial application under heavy traffic conditions. Frank D. Davis Co.

☐ **vapor barrier**

Glass fibers swirled into a waterproof laminant and permanently bonded under heat and pressure between 2 plies of kraft provide a vapor barrier with a wide variety of applications in concrete construction. Suggested uses are listed in a folder. Glas-Kraft, Inc.

☐ **truck cranes**

Five new trucks, capacities 35 through 80 tons, have been added to the Harnischfeger line. The 80-ton model is said to be the world's largest truck crane. It is capable of placing concrete, setting steel and handling lifts as high as a 21-story building. Harnischfeger Corp.



☐ **safety belt**

Designed especially for tying steel in place above ground level on walls, columns, and so forth, this belt assembly fastens securely to the re-bar, and frees workman's hands for safe handling and placement of reinforcing steel bars. The belt and snap assembly combination eliminates the need for costly scaffolding, and enables workman to climb easily and quickly as he builds. Ideal Reel Co.



☐ **portable heater**

Heater features a 2-pass stainless steel combustion chamber that burns out all objectionable odor and smoke. Air is supplied by a furnace-type blower instead of a fan for positive air circulation and quiet operation. Fuel pump, blower, and motor are direct coupled to eliminate v-belts. Fuel tank will operate heater for 14 hours of continuous burning. White Mfg. Co.



☐ **protective coating**

Applied by low pressure sprayer, glazing material takes from 30 to 60 minutes to dry and lasts at least 90 days. It prevents bonding of dirt, concrete and dust to surfaces so that chipping and scraping are eliminated, thus reducing cleaning and maintenance time. Non-staining, it imparts a polished appearance. Forrer's Products for Masonry.

☐ **floor coating**

Hard, wear resistant finish for floor surfaces penetrates surface, sealing against dirt, oil, grease and moisture, and helps to prevent deterioration of floor from decay or heavy traffic. May be applied to concrete, wood or linoleum, to produce a hard non-slippery surface. Available in 8 colors illustrated in form 456 C. West Chemical Products.

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THEN . . . turn to the back of this page and place a check in the boxes of any new product items you are interested in.

FILL IN . . . the rest of the information requested on your name, address, occupation.

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what a bright world this would be!

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